

Richmond 4CU 4th sidecut piping removed during October 2011 shutdown. Figure indicates locations that were sent to ETC. Points A-C were from a 12" section upstream of the P-1148/P-1148A Atmospheric Bottom Circulating Reflux Pumps. Points D-N were primarily from a 10" section downstream of the same pumps.

CML #5 on inspection piping isometric 0955-007-007 and CML #8 and #13 on inspection piping isometric 0955-007-008 were part of the removed piping. The section of the reducer kept for analysis did not include TML #8.

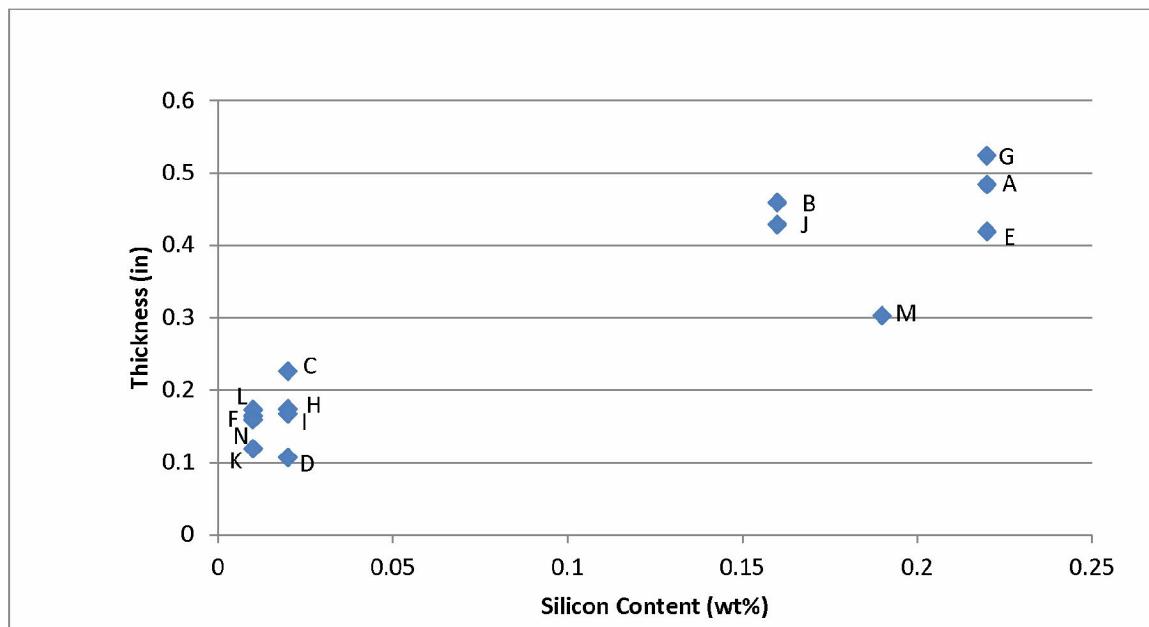


Figure 1: Plot of the silicon content in the components of the carbon steel section removed from Richmond 4CU 4th sidecut circuit. Silicon content was obtained from the chemical analysis results conducted at Anamet, Inc. The thickness is reported as that recorded from one ultrasonic thickness reading taken from the sample. Pipe sections include: A, C, D, F, H, I, K, L, and N. Elbows, tees, and reducers include: B, E, G, J and M.

Sample	Type	Visual Thickness	Anamet Si Content (wt%)	Average	UT Thickness (in)			
A	Pipe	Thick	0.22	0.484	0.474	0.484	0.490	0.487
B	Elbow	Thick	0.16	0.459	0.458	0.454	0.464	0.459
AB	Weld	Thick	0.46					
C	Pipe	Thin	0.02	0.226	0.224	0.254	0.214	0.212
D	Pipe	Thin	0.02	0.107	0.107			
E	Reducer	Thick	0.22	0.419	0.483	0.375	0.442	0.374
DE	Weld	Thick	0.13					
F	Pipe	Thin	0.01	0.164	0.163	0.163	0.173	0.155
G	Tee	Thick	0.22	0.524	0.541	0.482	0.598	0.474
FG	Weld	Thick	0.33					
H	Pipe	Thin	0.02	0.174	0.193	0.150	0.186	0.168
I	Pipe	Thin	0.02	0.167	0.140	0.199	0.160	0.168
IJ	Weld	Thick	0.62					
J	Tee	Thick	0.16	0.429	0.422	0.428	0.453	0.412
K	Pipe	Thin	0.01	0.119	0.098	0.110	0.152	0.115
L	Pipe	Thin	0.01	0.173	0.156	0.140	0.222	0.173
M	Elbow	Thick	0.19	0.303	0.291	0.297	0.327	0.298
LM	Weld	Thick	0.31					
N	Pipe	Thin	0.01	0.159	0.188	0.130	0.152	0.165

Figure 2: Table to Anamet chemical analysis and ultrasonic thickness readings as taken in the lab.

The follow images are to illustrate where each sample, A-N, was positioned when in operation. The first six with arrows show the exact location. The next several are to show different angles of the removed piping to see how they were connected in the field.

The first chemical analysis from Anamet sample H is actually J. This was miss labeled originally. The first report did not include H, so it was done seperately a few months later.

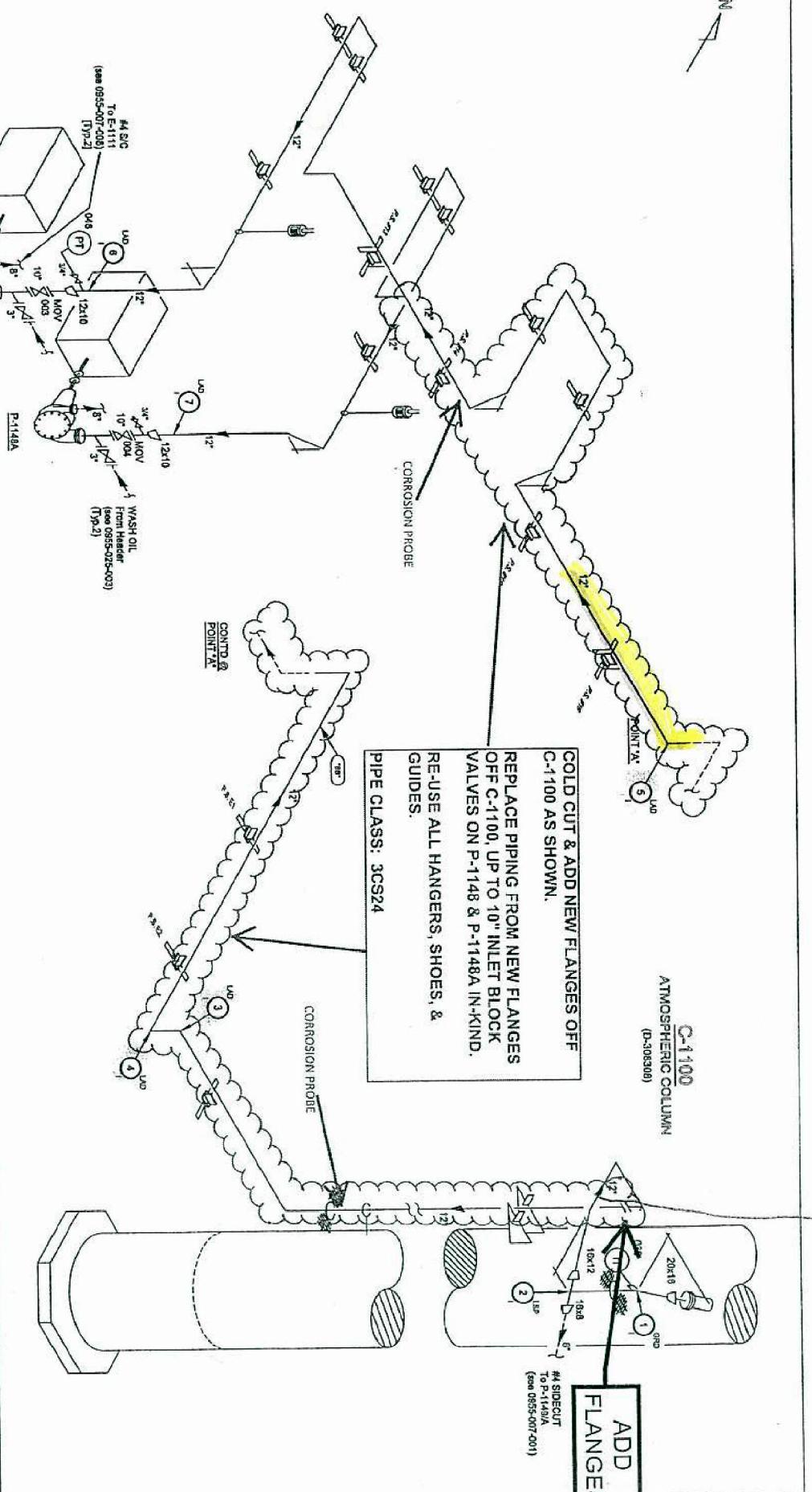
BE 143 - E 1

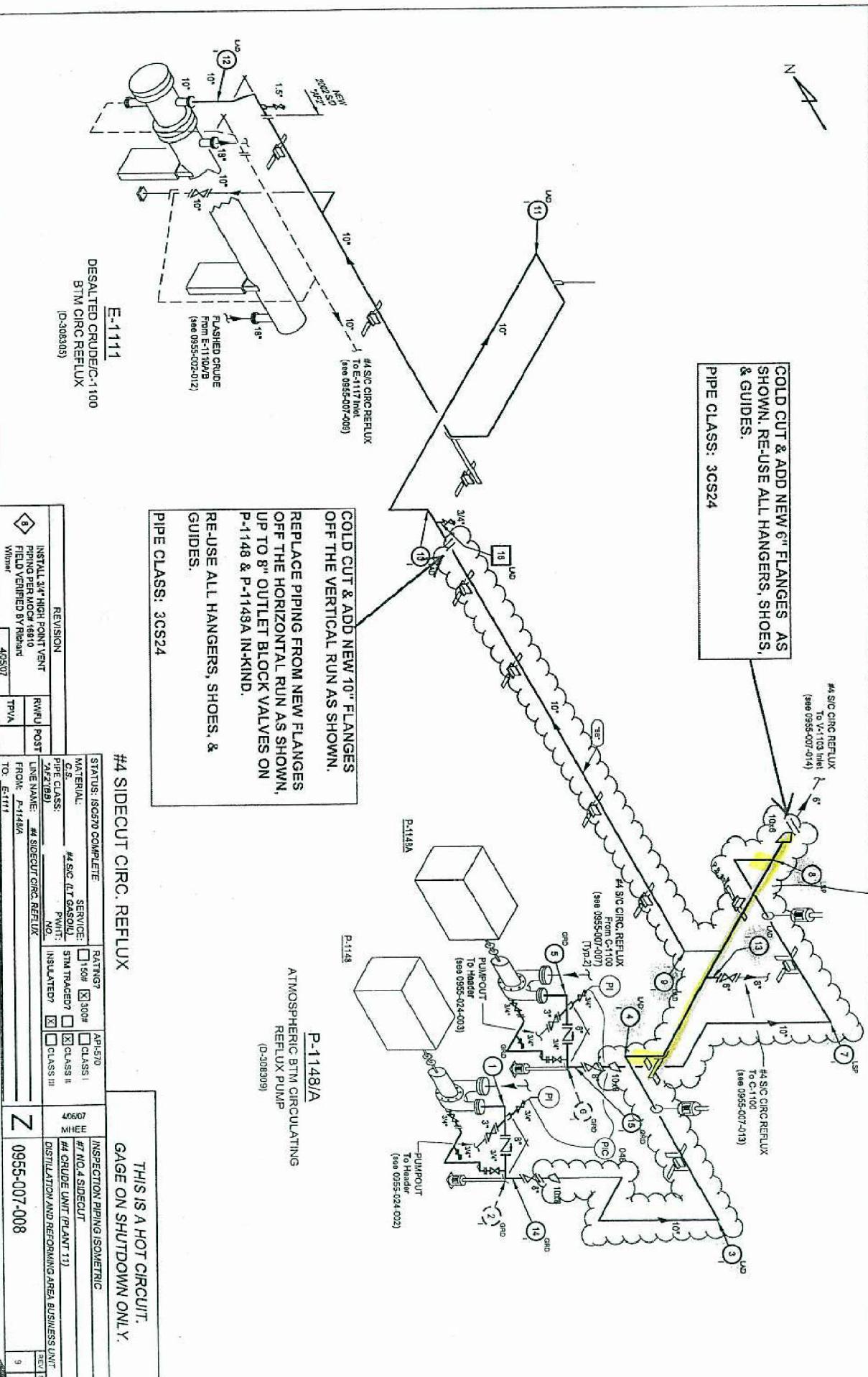
P-114A/A	
ATMOSPHERIC BTM CIRCULATING REFLUX PUMP	
(D-308309)	
FROM: C-1100	TO: P-114A/A
P-114A/A	

P-114A/A
ATMOSPHERIC BTM CIRCULATING
REFLUX PUMP

#4 SIDE CUT CIRC. REFLUX

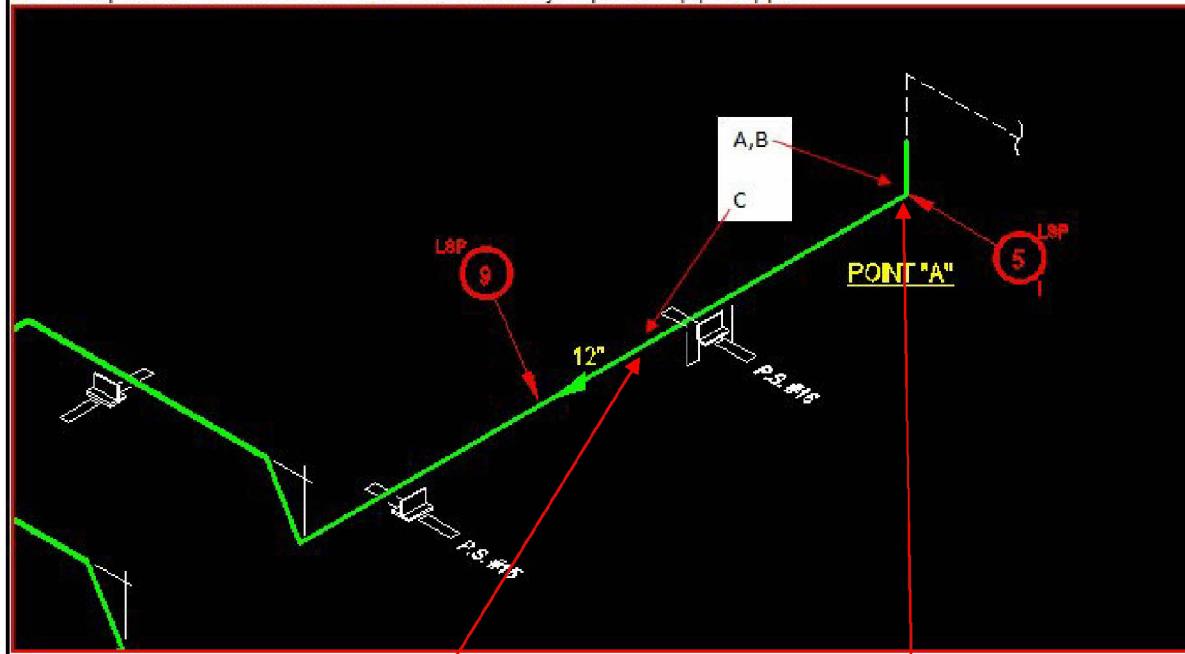
THIS IS A HOT CIRCUIT.
GAGE ON SHUTDOWN ONLY.





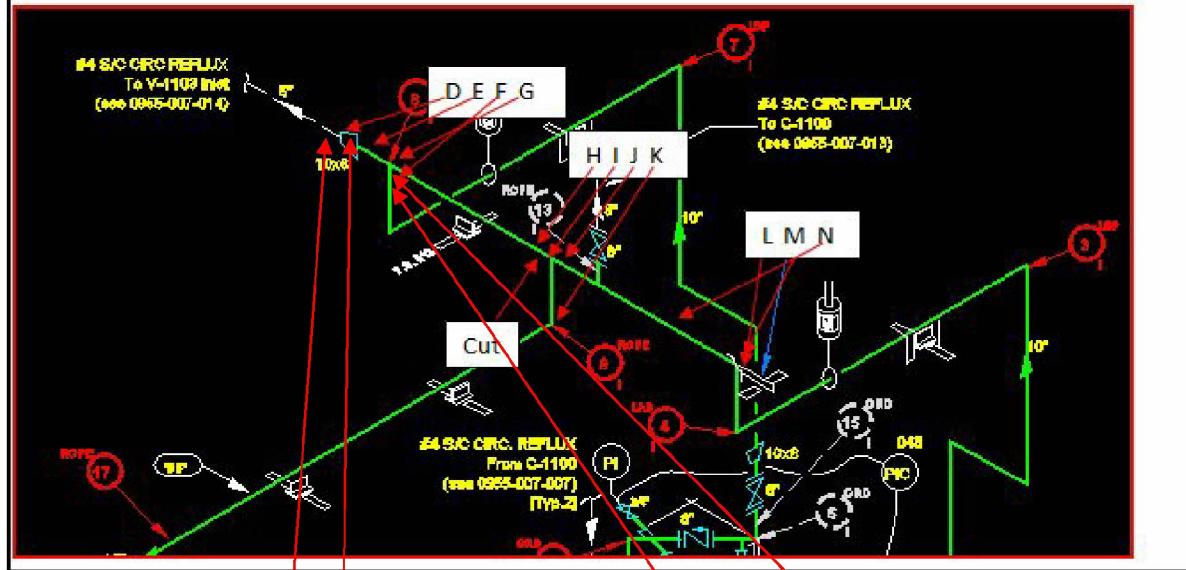
Iso Drawing # 0955-007-007

The third piece comes from the elbow with TML 5 to just past the pipe support.



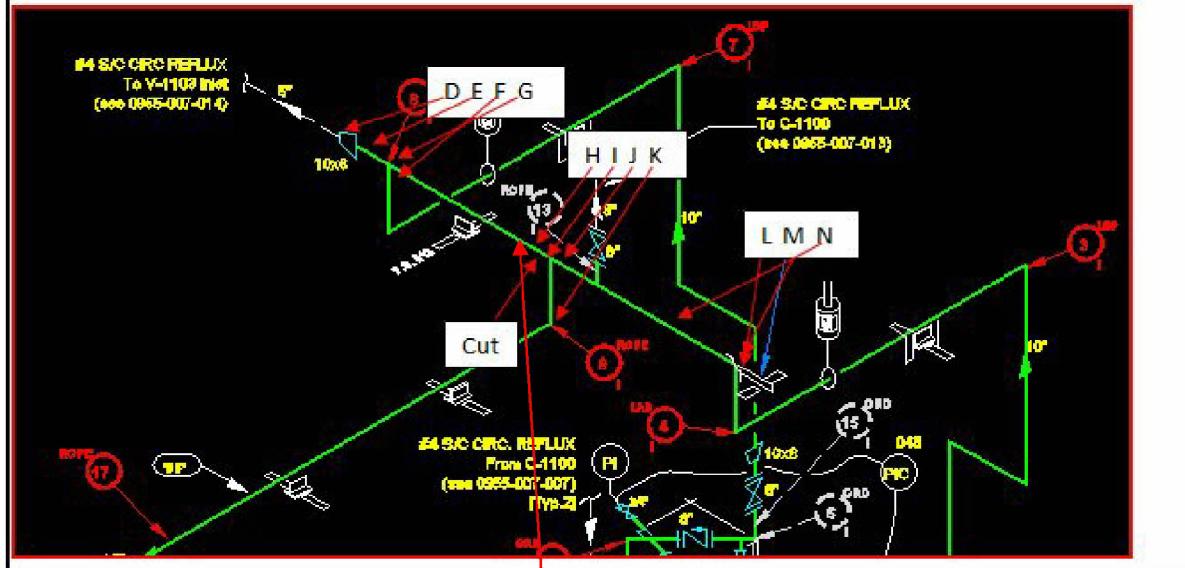
Iso Drawing# 0955-007-008

Two pieces come from the horizontal run with the 10x8 reducer on one end and the dummy leg on the other.



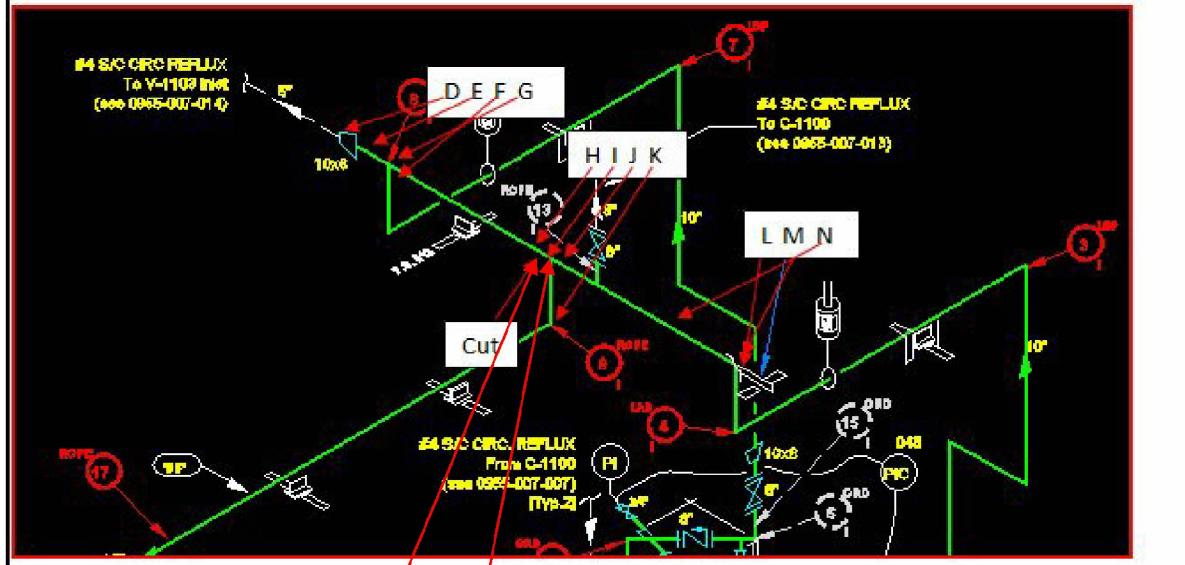
Iso Drawing# 0955-007-008

Two pieces come from the horizontal run with the 10x8 reducer on one end and the dummy leg on the other.



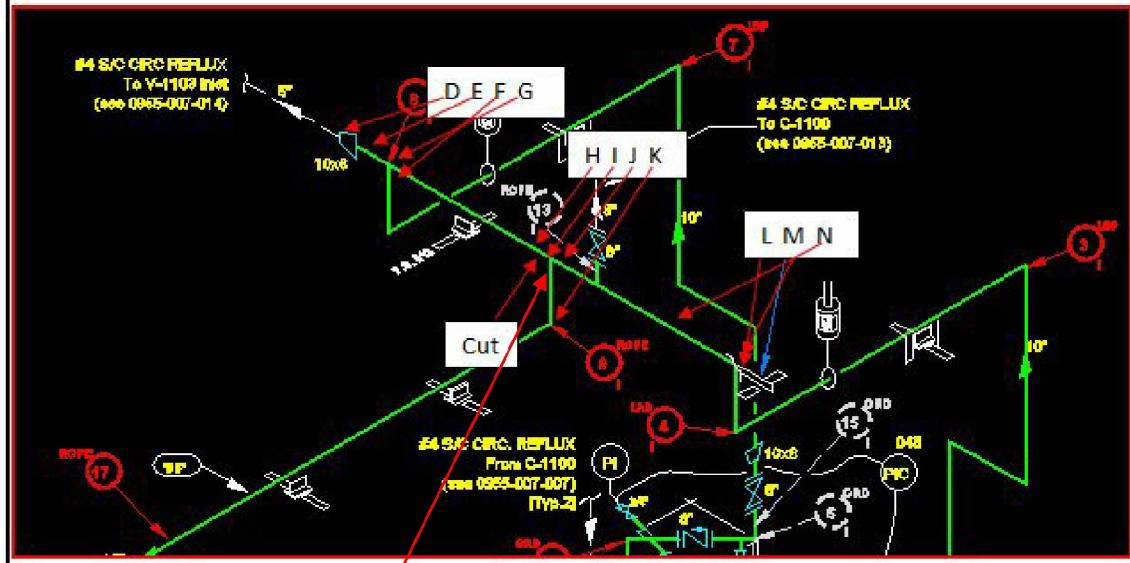
Iso Drawing# 0955-007-008

Two pieces come from the horizontal run with the 10x8 reducer on one end and the dummy leg on the other.



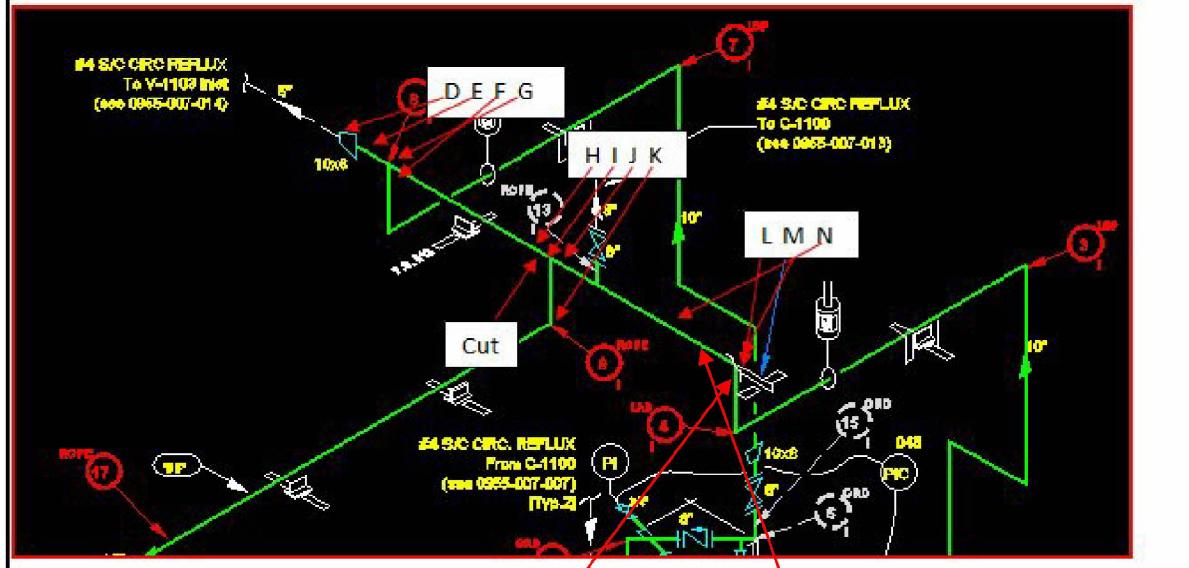
Iso Drawing# 0955-007-008

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Iso Drawing# 0955-007-008

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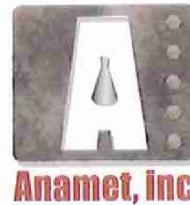




CUSA-CSB-0022306
EPA



LABORATORY CERTIFICATE



January 30, 2012

LABORATORY NUMBER: 5004.6865

CUSTOMER AUTHORIZATION: Req# 4504409-202
R-11-10176

DATE SUBMITTED: January 13, 2012

REPORT TO: ChevronTexaco Energy Technology Company
Materials Engineering Dept.
Attn: Daniel Chapman
P.O. Box 1627
Richmond, CA 94804SUBJECT:

Eighteen coupons were submitted for chemical analysis. The samples were identified as Carbon Steel Pipe, A Weld B, C, D Weld E, F Weld G, H Weld I, K, L Weld M and N.

SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

		A	B	Weld
Carbon	(C)	0.24	0.24	0.065
Chromium	(Cr)	0.07	0.04	0.04
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.02	0.02	0.17
Manganese	(Mn)	0.53	0.53	1.01
Molybdenum	(Mo)	0.01	0.02	0.01
Nickel	(Ni)	0.02	0.02	0.03
Phosphorus	(P)	0.026	0.017	0.026
Silicon	(Si)	0.22	0.16	0.46
Sulfur	(S)	0.028	0.023	0.026
Titanium	(Ti)	<0.005	<0.005	<0.005
Vanadium	(V)	<0.005	<0.005	<0.005

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Lab. No. 5004.6865

SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

		<u>D</u>	<u>E</u>	<u>Weld</u>
Carbon	(C)	0.25	0.19	0.14
Chromium	(Cr)	0.02	0.02	0.01
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.01	0.03	0.02
Manganese	(Mn)	0.76	0.82	0.37
Molybdenum	(Mo)	<0.005	<0.005	<0.005
Nickel	(Ni)	0.01	0.01	0.02
Phosphorus	(P)	0.012	0.014	0.012
Silicon	(Si)	0.02	0.22	0.13
Sulfur	(S)	0.015	0.013	0.018
Titanium	(Ti)	<0.005	<0.005	<0.005
Vanadium	(V)	<0.005	<0.005	<0.005

		<u>F</u>	<u>G</u>	<u>Weld</u>
Carbon	(C)	0.23	0.28	0.061
Chromium	(Cr)	0.01	0.10	0.04
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.01	0.01	0.15
Manganese	(Mn)	0.72	0.95	0.87
Molybdenum	(Mo)	<0.005	0.04	0.01
Nickel	(Ni)	0.01	0.01	0.01
Phosphorus	(P)	0.017	0.015	0.019
Silicon	(Si)	0.01	0.22	0.33
Sulfur	(S)	0.019	0.018	0.023
Titanium	(Ti)	<0.005	<0.005	<0.005
Vanadium	(V)	<0.005	<0.005	<0.005

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Lab. No. 5004.6865

SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

		<u>H</u>	<u>I</u>	<u>Weld</u>
Carbon	(C)	0.23	0.23	0.083
Chromium	(Cr)	0.01	0.02	0.04
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.01	0.01	0.13
Manganese	(Mn)	0.73	0.88	1.13
Molybdenum	(Mo)	<0.005	<0.005	0.01
Nickel	(Ni)	0.01	0.01	0.02
Phosphorus	(P)	0.011	0.015	0.014
Silicon	(Si)	0.16	0.02	0.62
Sulfur	(S)	0.020	0.022	0.021
Titanium	(Ti)	<0.005	<0.005	0.01
Vanadium	(V)	<0.005	<0.005	0.01

		<u>L</u>	<u>M</u>	<u>Weld</u>
Carbon	(C)	0.23	0.17	0.070
Chromium	(Cr)	0.02	0.02	0.03
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.01	0.03	0.14
Manganese	(Mn)	0.87	0.72	0.82
Molybdenum	(Mo)	<0.005	0.01	0.01
Nickel	(Ni)	0.01	0.01	0.01
Phosphorus	(P)	0.016	0.018	0.019
Silicon	(Si)	0.01	0.19	0.31
Sulfur	(S)	0.023	0.016	0.023
Titanium	(Ti)	<0.005	<0.005	<0.005
Vanadium	(V)	<0.005	<0.005	<0.005

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SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

		C	K	N
Carbon	(C)	0.22	0.23	0.21
Chromium	(Cr)	0.03	0.02	0.02
Columbium	(Cb)	<0.005	<0.005	<0.005
Copper	(Cu)	0.10	0.01	0.01
Manganese	(Mn)	0.86	0.88	0.89
Molybdenum	(Mo)	0.02	<0.005	<0.005
Nickel	(Ni)	0.02	0.01	0.01
Phosphorus	(P)	0.015	0.015	0.015
Silicon	(Si)	0.02	0.01	0.01
Sulfur	(S)	0.020	0.021	0.022
Titanium	(Ti)	<0.005	<0.005	<0.005
Vanadium	(V)	<0.005	<0.005	<0.005

This testing was completed on January 25, 2012 and performed in accordance with the customer's authorization.

Submitted by:

Edward A. Foreman
Quality Manager

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LABORATORY CERTIFICATE

March 15, 2012

LABORATORY NUMBER: 5004.7100
CUSTOMER AUTHORIZATION: Req# 4504409-206
DATE SUBMITTED: March 8, 2012
REPORT TO: Chevron Texaco Energy Technology Co.
Materials Engineering Dept.
Attn: Paul Hunter
P.O. Box 1627
Richmond, CA 94804

SUBJECT:

One part was submitted for chemical analysis. The sample was identified as Richmond 4
Crude 4 Side Cut Piping-Sample H.

SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

Carbon*	(C)	0.23
Chromium	(Cr)	0.02
Copper	(Cu)	<0.005
Manganese	(Mn)	0.84
Molybdenum	(Mo)	<0.005
Nickel	(Ni)	0.01
Phosphorus	(P)	0.012
Silicon	(Si)	0.02
Sulfur*	(S)	0.024
Titanium	(Ti)	<0.005
Vanadium	(V)	<0.005

* Determined by LECO combustion.